

Please substitute the paragraph starting at page 1, line 5 and ending at line 10, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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a1 -This invention relates to a movable camera apparatus, and particularly to a movable camera apparatus with a pan head in which a camera unit is driven in a pan (horizontal) direction and a tilt (vertical) direction so as to take a still picture or a motion picture.

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Please substitute the paragraph starting at page 1, line 12 and ending at line 20, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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a2 -A movable camera apparatus of this kind according to the prior art, for example, is Japanese Utility Model Application Laid Open No. 6-9264, in which a camera unit is supported for tilt (vertical) rotation by a vertical support erected from a horizontal supporting portion, and a main circuit board is erected on the horizontal supporting portion so as to be opposite in position to a vertical supporting portion relative to the camera unit.

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Please substitute the paragraph starting at page 1, line 21 and ending at page 2, line 1, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

93 - Another movable camera apparatus of this kind according to the prior art, for example, is Japanese Utility Model Publication No. 2-4319, in which two short vertical supporting portions are erected from a horizontal supporting portion and support a vertical (tilt) rotary shaft provided in the lowermost portion of a camera unit for vertical (tilt) rotation.

Please substitute the paragraphs starting at page 2, line 2 and ending at line 6, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

94 - Pan rotation is designed so as to be effected with only a journaled rotary shaft.

Also, a portion (a worm portion, a drive motor, etc.) of a tilt drive unit is disposed in the horizontal supporting portion.

Please substitute the paragraph starting at page 2, line 7 and ending at line 16, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

95 - Further, the vertical (tilt) rotary shaft is hollow, and a cable for transmitting a signal from the camera unit is inserted therethrough and is directed to the fixed portion of a pan head. The way of leading it about is a simple one in which the cable is merely passed through an internal gap, but an opening portion is barely provided in a

case member including a peripheral portion about which the cable is led, particularly the vertical support portion and the horizontal supporting portion near the root thereof.—

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Please substitute the paragraph starting at page 2, line 17 and ending at page 2, line 27, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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96 —According to the examples of the prior art as described above, the horizontal supporting portion supports the camera unit for vertical (tilt) rotation by an erected vertical supporting portion and, therefore, the load of the camera unit is concentrated in the tilt rotary shaft and bearing portion of the single vertical supporting portion. Thus, the surroundings of the tilt rotary shaft and the bearing portion must be mechanically strong and, as a result, the supporting portion becomes bulky and the entire apparatus becomes massive.—

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Please substitute the paragraph starting at page 3, line 1 and ending at line 10, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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97 —Also, since the main circuit board is erected on the horizontal supporting portion so as to be opposite in position to the vertical supporting portion relative to the camera unit, the weight of the horizontal (pan) supporting portion which is a movable portion is increased. Therefore, the acceleration or deceleration time becomes long and

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high-speed driving becomes impossible; alternatively, for effecting high-speed driving, a horizontal (pan) drive unit becomes bulky and the apparatus becomes massive.—

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Please substitute the paragraph starting at page 3, line 11 and ending at line 17, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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a8 —Further, the two vertical supporting portions erected from the horizontal supporting portion are short. Therefore, the space for escape during vertical (tilt) movement of the camera unit is small, and the range of vertical (tilt) movement has to be limited narrowly so that a portion of the camera unit may not abut against the horizontal supporting portion.—

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Please substitute the paragraph starting at page 3, line 25 and ending at page 4, line 6, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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a9 —Further, the vertical (tilt) rotary shaft provided in the lowermost portion of the camera unit is supported for vertical (tilt) rotation. Therefore, it will be apparent that the center of gravity of the camera unit is above the center of vertical (tilt) rotation. Therefore, the moment of inertia of vertical (tilt) rotation increases, and in order to obtain a necessary driving force, the vertical (tilt) drive unit becomes bulky and the apparatus becomes massive.—

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Please substitute the paragraph starting at page 4, line 7 and ending at line 13, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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a10 -Further, since an opening portion is barely provided in the case member including the peripheral portion about which the cable is led, particularly the vertical supporting portion and the horizontal supporting portion near the root thereof, the working property when the cable from the camera unit is led about in the fixed portion is very bad.

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Please substitute the paragraph starting at page 4, line 27 and ending at page 5, line 4, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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a11 -It is a first object of the present invention to support the vicinity of the center of gravity of the camera unit from opposite sides thereof, to thereby achieve downsizing of the apparatus as a result of optimization of the driving force.

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Please substitute the paragraph starting at page 5, line 5 and ending at line 9, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

912 Further, it is a second object of the present invention to design a camera unit that does not abut against a horizontal supporting portion during vertical driving of the camera unit, to thereby widen the range of tilt driving of the camera unit.

Please substitute the paragraph starting at page 7, line 11 and ending at line 27, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

913 The movable camera apparatus according to the present embodiment, as shown in Fig. 9, is comprised of a pan/tilt drive system 201, a taking lens system 202, a main circuit board 203, a camera circuit board 204 and an image pickup element circuit board 205, and the transmission and reception of signals such as a video signal and a camera control signal in each unit is executed through a connecting member such as a cable. The pan/tilt driving by the pan/tilt drive system 201 is effected by the driving command of the main circuit board 203. Also, control such as the focusing, zooming and adjusting of light quantity, such as stopping down of the light quantity for the taking lens and the image pickup operation by an image pickup element, such as a CCD, are executed by a taking lens control command from the main circuit board 203 through the camera circuit board 204 and the image pickup element circuit board 205.

Please substitute the paragraph starting at page 8, line 1 and ending at line 12, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

914 Also, by the connection of the main circuit board 203 to an external device 206, a photographed image can be displayed on the external device 206 side, and the pan/tilt control of the camera unit, or control such as the focusing, zooming and stopping down of the light quantity for the taking lens 202, can be executed from the external device 206. Specifically, connection terminals to the external device (controller) 206 such as a video output terminal and RS232C and a power source input terminal for the supply of a power source to the main body of the camera apparatus with a pan head are installed on the main circuit board 203.

Please substitute the paragraph starting at page 8, line 13 and ending at page 9, line 13, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

915 Referring to Fig. 1, the camera unit 1 is comprised of an image pickup optical system comprising a zoom and focus optical system, an exposure adjusting device (not shown), a lens unit 2 (202) comprising a drive system for driving them, an image pickup element circuit board 3 (205) which is disposed rearwardly of the lens unit 2 and on which an image pickup element is installed, a camera circuit board 4 (204) disposed sideways of the lens unit 2 and connected to the image pickup element circuit board 3, an upper camera case 5 and a lower camera case 6 including the aforedescribed constructions and formed by a resin mold, thin metal plates 7 and 8 formed so as to cover each construction inside the camera unit 1 and attached to the upper camera case 5 and the lower camera case 6, respectively, by heat caulking or the like, a threaded ring 9 (see Fig. 2) for

mounting a filter or the like mounted forwardly of the lens unit 2 so as to be sandwiched by and between the upper camera case 5 and the lower camera case 6, tilt rotary shafts 10 and 11 mounted on the lower camera case 6, fitted in the aperture portions 12a-1-a and 12a-2-a, respectively, of the camera supporting portions 12a-1 and 12a-2 of a pan head 12 which will be described later, and making the camera unit 1 rotatable in a tilt direction, etc. The tilt rotary shafts 10 and 11 may desirably be formed of a material high in lubricity and low in friction.—

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Please substitute the paragraph starting at page 9, line 18 and ending at line 27, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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9/b —The tilt rotary shafts 10 and 11 have their shaft portions 10a and 11a fitted in aperture portions 6a and 6b, respectively, provided in the sides of the lower camera case 6, and fastened and fixed by self-tap apertures 10b-1, 10b-2 and apertures 11b-1, 11b-2 formed in flange portions 10b and 11b, respectively, and restraining apertures 6c-1, 6c-2 and 6d-1 6d-2 formed in opposite sides of the lower camera case 6.—

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Please substitute the paragraph starting at page 10, line 1 and ending at line 5, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.



917 -When the tilt rotary shafts 10 and 11 are mounted on the lower camera case 6, the end surfaces 10a-1 and 11a-1 of the shaft portions 10a and 11a are dimensionally set so as to somewhat protrude from the opposite sides of the lower camera case 6.

Please substitute the paragraph starting at page 11, line 6 and ending at line 22, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

918 -The image pickup element circuit board 3 and the camera circuit board 4 are fastened and fixed at predetermined positions by a shaft portion 2a having a self-tap aperture formed in the lens unit 2. Two measures are conceivable as the predetermined positions of the camera circuit board 4. One of them, as shown in Fig. 1, is a measure of installing the camera circuit board on the camera supporting portion side lateral of the lens unit 2. According to this measure, a space for the board need not be provided upwardly or downwardly of the camera unit portion, and the size in the height direction can be made small. This is advantageous for downsizing in the height direction. Also, this position is close to the camera supporting position 12a-1. Therefore, the connecting members 16 and 17 may be short, and this is also advantageous for the saving of natural resources.

Please substitute the paragraph starting at page 11, line 23 and ending at page 12, line 10, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

919 -The other is a measure of disposing the camera circuit board above or below the camera unit 1. According to this method, the space for the board 4 need not be provided widthwisely of the camera unit 1, and this is advantageous for downsizing in the withdwise direction. The image pickup element circuit board 3 and the camera circuit board 4 are connected together by a connecting member such as a flexible printed board. Also, the end portion of one of the connecting members 16 and 17 extending toward the main circuit board 18 of the pan head 12, which will be described later, is connected from the camera circuit board 4 by a connector or the like, and the passes through the hollow portion 10c of the tilt rotary shaft 10.

Please substitute the paragraph starting at page 12, line 20 and ending at line 26, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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920 -The construction of the pan head 12 of the camera apparatus with a pan head according to the present embodiment will now be described. The pan head 12 is divided into a movable portion 12a and fixed portion 12b. The movable portion 12a in turn is divided into camera supporting portions 12a-1, 12a-2 and a movable base portion (not shown).

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Please substitute the paragraph starting at page 12, line 27 and ending at page 13, line 11, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

921 -Description will first be made of the construction and mounting of the camera supporting portions 12a-1, 12a-2 of the movable portion 12a. The camera supporting portion 12a-1 is erected from the movable base portion. The camera supporting portion 12a-1 is provided with an aperture portion 12a-1-a coaxially with the central axis of tilt rotation, and the shaft portion 10e of the tilt rotary shaft 10 is fitted thereto. Also, provision is made of guides 13a, 13b, 14a, 14b and 15 for regulating the volute diameters of the connecting members 16 and 17 (Fig. 2) and guiding them to the main circuit board 18.

Please substitute the paragraph starting at page 14, line 27 and ending at page 15, line 5, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

922 -Also, during tilt driving, a bending load repeatedly applied to the connecting members 16 and 17 can also be greatly mitigated, and breakage or the like of the connecting members due to metal fatigue of the conductor portions thereof can be prevented, and the durability of the apparatus is markedly improved.

Please substitute the paragraph starting at page 17, line 3 and ending at line 11, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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923 -The slip mechanism is effective to prevent a worm portion to be described, which is the drive transmitting mechanism of the worm wheel 22, from being damaged by the rotating force of the worm wheel 22 mounted on the tilt rotary shaft 11, for example, when an unexpected extraneous force is applied to the camera unit 1 and a tilt rotating force works, thereby causing aggravation of the accuracy of tilt rotation or bad tilt rotation. —

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Please substitute the paragraph starting at page 17, line 12 and ending at line 27, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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924 -Specifically, when an unexpected rotating force by an extraneous force works on the worm wheel 22, that surface of the worm wheel 22 which is adjacent to the frictional member 21 or that surface of the supporting metal plate 20 which is adjacent to the frictional member 21 tilt-rotates while rubbing against the frictional member 21 with the meshing position between the worm wheel 22 and the worm portion (not shown) maintained (with the worm wheel 22 and the worm portion being not rotated but remaining stopped). This frictional force is of such a value as will not cause slip by the setting of the amount of deformation of the wave-shaped washer 23 (Fig. 1), in the state of normal driving (driving by the electrical energization of a tilt motor 28 (Fig. 1)). —

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Please substitute the paragraph starting at page 18, line 1 and ending at line 17, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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935 -Fig. 3 shows the internal structure of the camera apparatus with a pan head according to the present embodiment as it is seen from a side thereof, and also shows a state in which the interior of the left supporting portion 12a-2 and the interiors of the movable portion 12a and fixed portion 12b of the pan head are exposed. The reference numeral 25 designates a tilt driving unit. A tilt motor 28 having a first gear 27 mounted thereon is fastened to a metal plate 26 by screws or the like, and a worm shaft 32 journaled by bearings (not shown) and subjected to a biasing force for eliminating the backlash of the worm wheel side and in the thrust direction of the worm shaft by a leaf spring (not shown) is disposed, and the first gear 27 and a second gear portion (not shown) of the worm shaft 32 are connected together by a timing belt 33.

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Please substitute the paragraph starting at page 18, line 18, and ending at line 25, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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936 -Also, the worm portion (not shown) of the worm shaft 32 is threadably engaged with the worm wheel 22. The above described tilt driving unit is fastened to the interior of the camera supporting portion 12a-2 (Fig. 1) by screws or the like, and design is

made such that when the tilt motor 28 is electrically energized, the driving force thereof is transmitted and the camera—

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Please substitute the paragraph starting at page 18, line 26 and ending at page 19, line 5, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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927 —The left supporting portion 12a-2 includes a relay board (not shown) on which there are provided a connector (not shown) of a connecting member 35 from the main circuit board 18 (Fig. 1), a connector (not shown) of a connecting member (not shown) from the terminal of the tilt motor 28, and a connector (not shown) of a connecting member (not shown) from a position detector such as a photo-interrupter.—

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Please substitute the paragraph starting at page 19, line 6 and ending at line 12, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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928 —This relay board succeeds to the tilt motor 28 and the position detector and the main circuit board 18 (Fig. 1) and relays signal transmission. The connecting member 35 is bent in the camera supporting portion 12a-2 (Fig. 1) and is directed to the central portion of the apparatus. The relay board 34 may be provided in the right supporting portion 12a-1.—

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Please substitute the paragraph starting at page 20, line 3 and ending at line 12, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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q 29 - A cap member 43 is designed such that when it is fitted in a direction to deform the wave-shaped washer by an abutting surface 43b while being fitted to an outer peripheral portion 43a somewhat smaller than the inner diameter of a worm wheel 44, snap fit pawl portions 43c, 43d come into engagement with a groove portion 41a-1 provided in the shaft portion 41a and the cap member 43 is locked to the shaft portion 41a and a slipping force similar to that on the tilt side works.

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Please substitute the paragraph starting at page 20, line 21 and ending at line 26, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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q 30 - The connecting members 16, 17 (Fig. 2) and 35 (Fig. 1) led about from the camera supporting portions 12a-1 and 12a-2 in Fig. 1 to the vicinity of the shaft portion 41a are guided to a pan case 48 which will be described later by a groove portion 41a-2 provided in the shaft portion 41a.

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Please substitute the paragraph starting at page 24, line 19 and ending at line 24, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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31 --Also, the bending load repeatedly applied to the connecting members 16, 17 and 35 during pan driving can be greatly mitigated, and breakage or the like of the connecting members due to metal fatigue of the conductor portions thereof can be prevented and the durability of the apparatus is markedly improved.--

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Please substitute the paragraph starting at page 26, line 19 and ending at page 27, line 19, with the following replacement paragraph. A marked-up copy of this paragraph, showing the changes made thereto, is attached.

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31 --The pan head fixing case 50, as shown in Figs. 4 and 5, is provided with three protruding pieces 50a, 50b and 50c, on the upper surface portions of which are mounted sliding members 104a, 104b and 104c made of resin or the like high in lubricity. These are members for restraining the movable portion 12a of the pan head from inclining when it performs the tilt/pan operation (particularly when it performs acceleration and deceleration). If the movable portion 12a of the pan head inclines greatly, the photographing optical system will deviate from a predetermined position and therefore, a desired photographing track (by pan/tilt) will not be obtained and in some cases, intended photographing cannot be effected and therefore, the movable portion 12a of the pan head may preferably be designed so as not to incline to the utmost. Fig. 6 is a cross-sectional view of the surroundings of the sliding member 104c. A sliding surface 12a-4-a is provided on the circumference of the umbrella portion 12a-4 of the movable portion 12a of the pan head so as to contact with the sliding members 104a, 104b and 104c and slide when the movable portion 12a of the pan head inclines slightly, thereby restraining the